

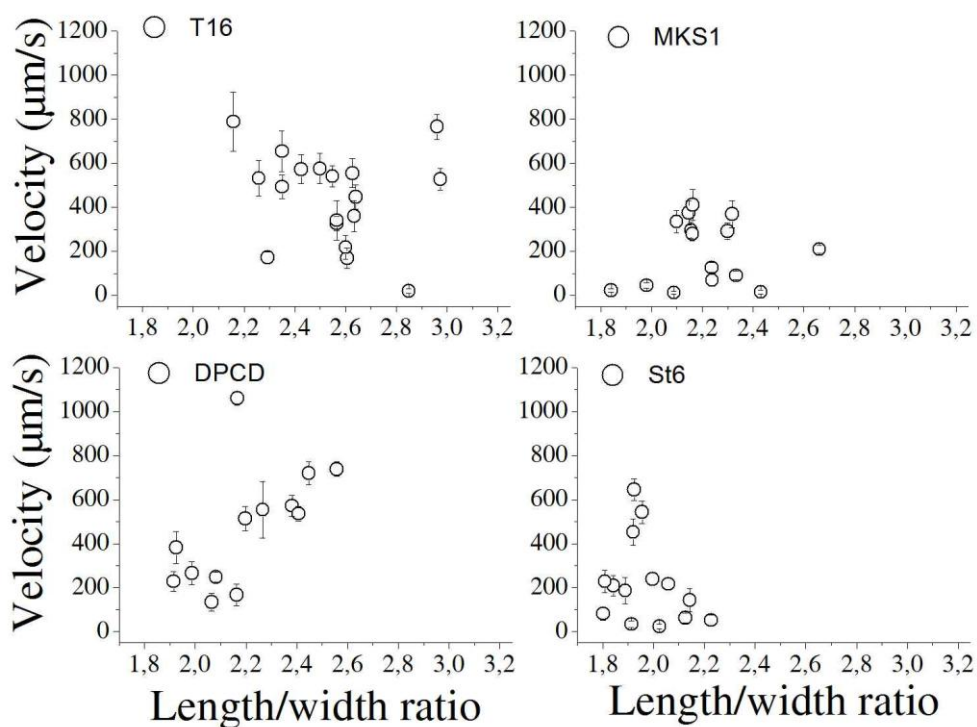
## SUPPLEMENTARY MATERIAL

**S1.** Movie of an extracted cilia sequence.

**S2.** Movie of a control cell swimming in a microchannel.

**S3.** Movie of a “young” control cell swimming in a microchannel.

**S4.** Correlation plot of length/width ratio against velocity for all cell types.



**S5.** Movie of a T16 knock down cell swimming in a microchannel.

**S6.** Movie of a DPCD knock down cell swimming in a microchannel.

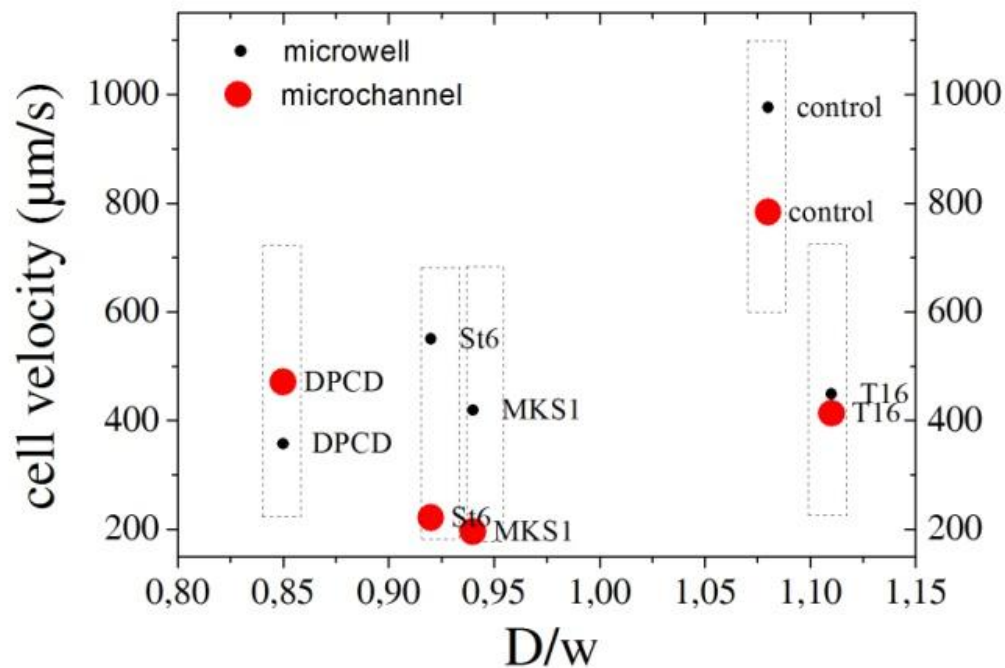
**S7.** Movie of a St6 knock down cell swimming in a microchannel.

**S8.** Movie of a MKS1 knock down cell swimming in a microchannel.

**S9.** Movie of a MKS1 knock down cell pushing into a maze-like microchannel wall.

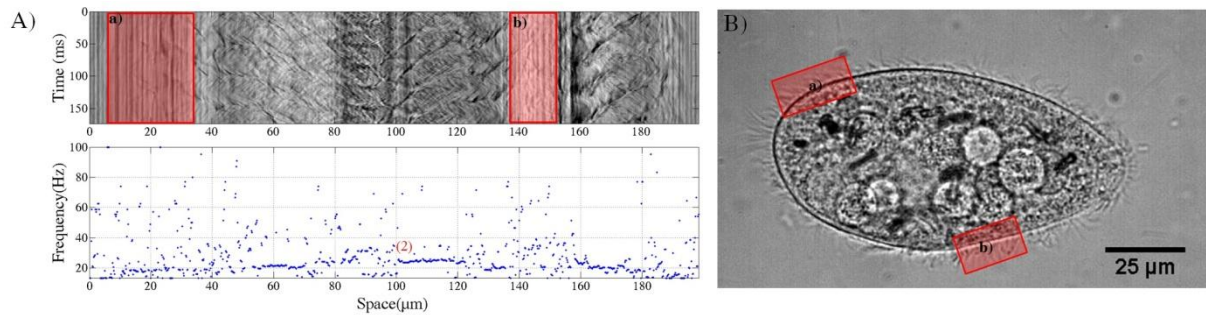
**S10.** Movie of a control cell turning in a maze-like microchannel.

**S11.** Cell velocity against D(depth channel)/w(width cell) ratio plot.

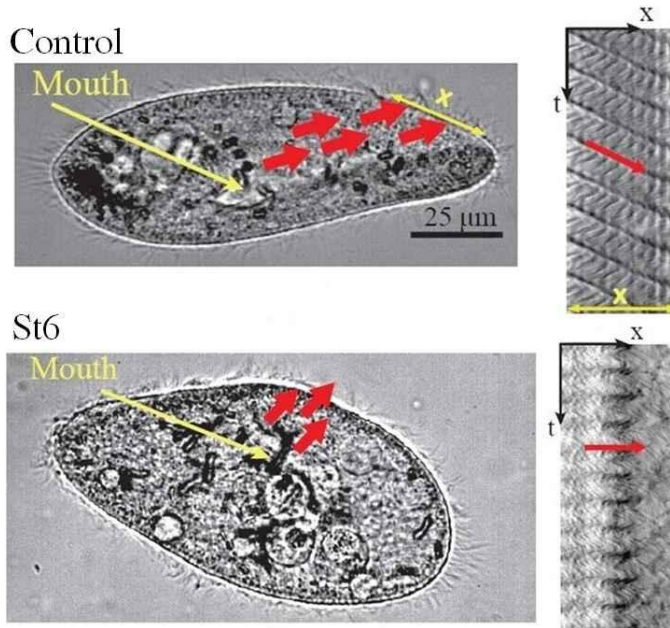


**S12.** Movie showing the microbead transport by the peristomeal cilia from the tip of the cell body towards the gullet of a control cell swimming in a microchannel.

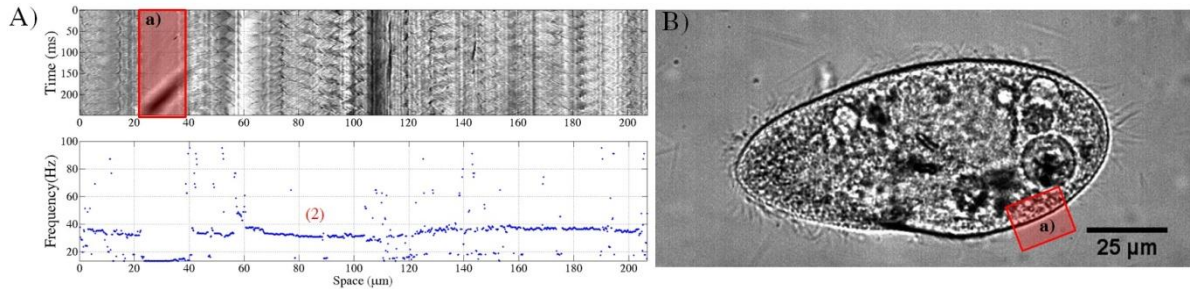
**S13.** Space-time diagram of a St6 cell (A) and image of a St6 cell (B) with partial inactive cilia.



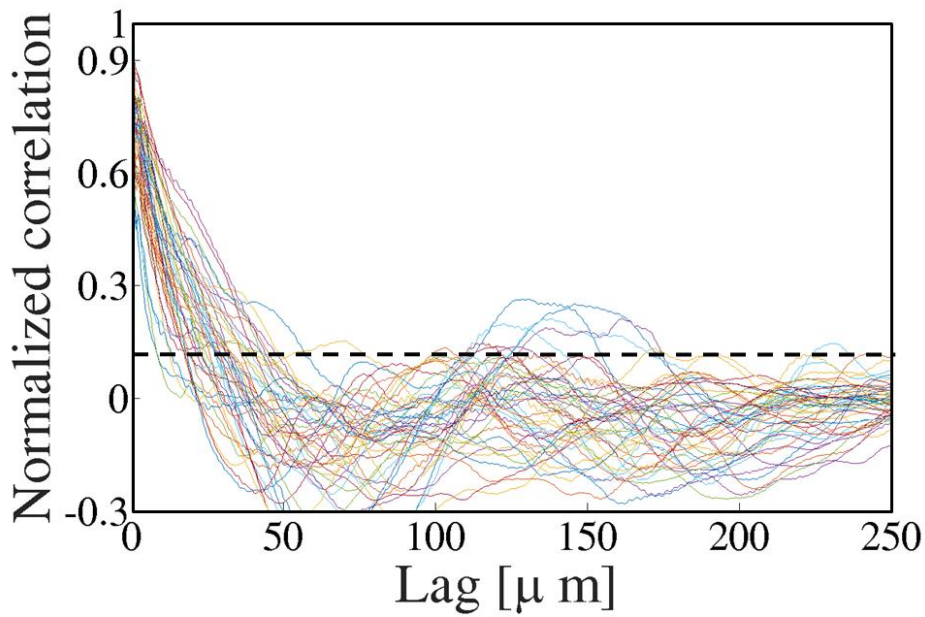
**S14.** Mouth wave direction (red arrows) and space-time diagram of the peristomeal region for a St6 knock down cell in comparison with a control cell.



**S15.** Space-time diagram of a MKS1 cell (A) and image of this MKS1 cell (B) partly lacking cilia.



**S16.** Spatial correlation coefficient ( $C$ ) plot for the control. The correlation length  $L_C$  is extracted from each measurement for  $C$  crossing the value of 0.1 (dashed black line).



**S17.** Velocity against CBF mouth/peristomeal region correlation plot.

